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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,113	07/11/2003	Rajeev Joshi	11948.21	8697

27966 7590 01/03/2006

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EXAMINER	
ZARNEKE, DAVID A	

ART UNIT	PAPER NUMBER
2891	

DATE MAILED: 01/03/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/618,113	JOSHI ET AL.	
	Examiner	Art Unit	
	David A. Zarneke	2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *20-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *20-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments regarding (1) the RDL "connected to" as opposed to "on" the pad, and (2) the motivation to combine Higgins and Chakravorty, filed 10/13/05, have been fully considered but they are not persuasive.

As to the first argument, Higgins, Figure 1, clearly shows the RDL trace (16) as, at least partly, "on" the pad (14). Further, the term "connected" is broader than the term "on", since applicant is apparently arguing that there could be other ways of "connecting" the RDL to the pad. Therefore, Higgins' teaching of "connected to" would clearly include "on".

In re the second argument, two points were presented.

The first point was that since Chakravorty does not teach an RDL trace it could not be combined with Higgins. It is noted that the rejection is a combination of references, both references do not have to have all the limitations of the claim. this argument attacks the references individually and does not consider the combination. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The second point is the solder ball on the solder bump is not a known equivalent to a solder bump alone because Higgins teaches a substrate (50) that would be

between the ball and the bump while Chakravorty merely teaches a ball on a bump with nothing in between. Please note that the rejection considers the ball of Chakravorty would be put directly on bump (20) before the substrate (50) would be attached.

Applicant's arguments regarding the UBM pad, filed 10/13/05, have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 20, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III, US Patent 6,294,405 (hereafter Higgins).

Higgins (Figure 1) teaches a method of making a wafer-level chip scale package, comprising:

providing a chip pad (14) over a substrate (11);

providing a re-distributed line (RDL) pattern (16) on the chip pad;

providing an insulating layer (18) covering a portion of the RDL pattern, wherein the insulating layer comprises a non-polymeric dielectric material (2, 65+); and

providing a stud bump (20) directly on the portion of the RDL pattern not covered by the insulating layer.

Regarding the bump being "directly" on the RDL, Higgins discloses the claimed invention except for the inclusion of a UBM pad. It would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art (*In re* Karlson, 136 USPQ 1284).

The invention of Higgins would still operate without the UBM pad. Its exclusion from Higgins, along with the function of the UBM layer, would not make the invention

inoperable and would have been well-known and readily obvious to one of ordinary skill in the art.

Regarding claim 22, Higgins teaches the insulating layer comprises SiN (2, 65+).

With respect to claim 23, as noted above, while Higgins teaches using a UBM, it would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art (*In re* Karlson, 136 USPQ 1284).

The invention of Higgins would still operate without the UBM pad. Its exclusion from Higgins, along with the function of the UBM layer, would not make the invention inoperable and would have been well known and readily obvious to one of ordinary skill in the art.

Claims 24, and 26-28 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Higgins, III, US Patent 6,294,405 (hereafter Higgins).

Higgins (Figure 1) teaches a method of making a wafer-level chip scale package, comprising:

providing a substrate (11) with a passivation layer (12) on a portion thereof;

forming a chip pad (14) on a portion of the substrate not containing the passivation layer;

forming a metal layer (16) on the chip pad and a portion of the passivation layer;

forming an insulating layer (18) on a portion of the metal layer, wherein the insulating layer comprises a non-polymeric dielectric material (2, 65+); and

forming a stud bump (20) directly on the portion of the metal layer not covered by the insulating layer.

Regarding the bump being "directly" on the RDL, It would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art (*In re* Karlson, 136 USPQ 1284).

The invention of Higgins would still operate without the UBM pad. Its exclusion from Higgins, along with the function of the UBM layer, would not make the invention inoperable and would have been well known and readily obvious to one of ordinary skill in the art.

Regarding claim 26, Higgins teaches the insulating layer comprises SiN (2, 65+).

With respect to claims 27, while Higgins fails to expressly state that the insulating layer is formed without using a high temperature curing process, SiN inherently uses a low temperature curing process.

With respect to claim 28, as noted above, while Higgins teaches using a UBM, it would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art (*In re* Karlson, 136 USPQ 1284).

The invention of Higgins would still operate without the UBM pad. Its exclusion from Higgins, along with the function of the UBM layer, would not make the invention

inoperable and would have been well known and readily obvious to one of ordinary skill in the art.

Claim 32 is rejected under 35 U.S.C. 102(b) as being clearly anticipated by Higgins, III, US Patent 6,294,405 (hereafter Higgins).

Higgins (Figure 1) teaches a method of making a package semiconductor device, comprising:

providing a chip pad (14) over a substrate (11);

providing a re-distributed line (RDL) pattern (16) on the chip pad;

providing an insulating layer (18) covering a portion of the RDL pattern, wherein the insulating layer comprises a non-polymeric dielectric material (2, 65+); and

providing a stud bump (20) directly on the portion of the RDL pattern not covered by the insulating layer.

Regarding the bump being "directly" on the RDL, It would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art (*In re* Karlson, 136 USPQ 1284).

The invention of Higgins would still operate without the UBM pad. Its exclusion from Higgins, along with the function of the UBM layer, would not make the invention inoperable and would have been well known and readily obvious to one of ordinary skill in the art.

Claim 33 is rejected under 35 U.S.C. 102(b) as being clearly anticipated by Higgins, III, US Patent 6,294,405 (hereafter Higgins).

Higgins (Figure 1) teaches a method of making a wafer-level chip scale package, comprising:

providing a packaged semiconductor device (10) containing a chip pad (14) over a substrate (11), a re-distributed line (RDL) pattern (16) on the chip pad, an insulating layer (18) covering a portion of the RDL pattern with the insulating layer comprising a non-polymeric dielectric material (2, 65+), and then providing a stud bump (20) directly on the portion of the RDL pattern not covered by the insulating layer; and

mounting the packaged semiconductor device on a circuit board (50).

Regarding the bump being "directly" on the RDL, It would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art (*In re* Karlson, 136 USPQ 1284).

The invention of Higgins would still operate without the UBM pad. Its exclusion from Higgins, along with the function of the UBM layer, would not make the invention inoperable and would have been well known and readily obvious to one of ordinary skill in the art.

Claims 34, 38-40 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Higgins, III, US Patent 6,294,405 (hereafter Higgins).

Higgins (figure 1) teaches a method for making wafer-level chip scale package, comprising:

providing a chip pad [12] over a substrate [11];

providing a re-distributed line (RDL) pattern [16] on the chip pad;

providing an insulating layer [18] covering a portion of the RDL pattern; and

providing a stud bump [20] on the portion of the RDL pattern not covered by the insulating layer without using an under bump metal.

Higgins discloses the claimed invention except for the inclusion of a UBM pad. It would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art (*In re* Karlson, 136 USPQ 1284).

The invention of Higgins would still operate without the UBM pad. Its exclusion from Higgins, along with the function of the UBM layer, would not make the invention inoperable and would have been well-known and readily obvious to one of ordinary skill in the art.

Regarding claims 38-40, Higgins teaches the insulating layer [18] comprises a non- polymeric dielectric material, such as silicon nitride (2, 65+), which does not require a high temperature curing process.

Claims 41, 45-47 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Higgins, III, US Patent 6,294,405 (hereafter Higgins).

Higgins (figure 1) teaches a method for making wafer-level chip scale package, comprising:

providing a chip pad [12] over a substrate [11];

providing a single layer re-distributed line (RDL) pattern [16] on the chip pad;

providing an insulating layer [18] covering a portion of the RDL pattern; and

providing a stud bump [20] on the portion of the RDL pattern not covered by the insulating layer.

Regarding claims 45-47, Higgins teaches the insulating layer [18] comprises a non- polymeric dielectric material, such as silicon nitride (2, 65+), which does not require a high temperature curing process.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III, US Patent 6,294,405, as applied to claim 20 above, and further in view of Chakravorty, US Patent 6,350,668.

Higgins fails to teach the method further comprising providing a solder ball on the stud bump.

Chakravorty (figure 8d) teaches the use of a solder ball (313) on a solder stud (311).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ball on the stud of Chakravorty in the invention of Higgins because both methods are known equivalent techniques used to attach chips to other substrates.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16

USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

Claims 25 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III, US Patent 6,294,405, as applied to claim 24 above, and further in view of Chakravorty, US Patent 6,350,668.

Regarding claim 25, Higgins fails to teach the method further comprising providing a solder ball on the stud bump.

Chakravorty (figure 8d) teaches the use of a solder ball (313) on a solder stud (311).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ball on the stud of Chakravorty in the invention of Higgins because both methods are known equivalent techniques used to attach chips to other substrates.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

With respect to claims 29 and 30, Higgins fails to teach forming the stud bump by electroplating or by wire bonding (claims 29), wherein the stud bump is formed by wire bonding a Pd coated copper wire to the RDL pattern using a capillary (claim 30).

Chakravorty teaches the solder stud (311) can be formed using a wire bonder (9, 16+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the wire bonder of Chakravorty in the invention of Higgins because wire bonding is a known equivalent technique used to deposit metals.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

Though Chakravorty fails to teach the use of a Pd coated copper wire, it would have been obvious to use a Pd coated copper wire because it is a conventionally known in the art material used to form stud bumps.

The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

As to claim 31, the stud bump being coined shaped is an obvious matter of design choice. Design choices and changes of size and shape are generally recognized as being within the level of ordinary skill in the art (MPEP 2144.04(I), (IVA) & (IVB)).

Claims 35-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III, US Patent 6,294,405, as applied to claim 34 above, and further in view of Chakravorty, US Patent 6,350,668.

Regarding claim 35, Higgins fails to teach the method further comprising providing a solder ball on the stud bump.

Chakravorty (figure 8d) teaches the use of a solder ball (313) on a solder stud (311).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ball on the stud of Chakravorty in the invention of Higgins because both methods are known equivalent techniques used to attach chips to other substrates.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

With respect to claims 36 and 37, Higgins fails to teach forming the stud bump by electroplating or by wire bonding (claims 29), wherein the stud bump is formed by wire bonding a Pd coated copper wire to the RDL pattern using a capillary (claim 30).

Chakravorty teaches the solder stud (311) can be formed using a wire bonder (9, 16+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the wire bonder of Chakravorty in the invention of Higgins because wire bonding is a known equivalent technique used to deposit metals.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16

USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

Though Chakravorty fails to teach the use of a Pd coated copper wire, it would have been obvious to use a Pd coated copper wire because it is a conventionally known in the art material used to form stud bumps.

The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

Claims 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III, US Patent 6,294,405, as applied to claim 41 above, and further in view of Chakravorty, US Patent 6,350,668.

Regarding claim 35, Higgins fails to teach the method further comprising providing a solder ball on the stud bump.

Chakravorty (figure 8d) teaches the use of a solder ball (313) on a solder stud (311).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ball on the stud of Chakravorty in the invention of Higgins because both methods are known equivalent techniques used to attach chips to other substrates.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin

125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

With respect to claims 36 and 37, Higgins fails to teach forming the stud bump by electroplating or by wire bonding (claims 29), wherein the stud bump is formed by wire bonding a Pd coated copper wire to the RDL pattern using a capillary (claim 30).

Chakravorty teaches the solder stud (311) can be formed using a wire bonder (9, 16+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the wire bonder of Chakravorty in the invention of Higgins because wire bonding is a known equivalent technique used to deposit metals.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

Though Chakravorty fails to teach the use of a Pd coated copper wire, it would have been obvious to use a Pd coated copper wire because it is a conventionally known in the art material used to form stud bumps.

The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

Claim 48 is rejected under 35 U.S.C. 102(b) as being clearly anticipated by Higgins, III, US Patent 6,294,405 (hereafter Higgins), in view of Chakravorty, US Patent 6,350,668.

Higgins (figure 1) teaches a method for making wafer-level chip scale package, comprising:

providing a chip pad [12] over a substrate [11];

providing a re-distributed line (RDL) pattern [16] on the chip pad without using an under bump metal;

providing an insulating layer [18] covering a portion of the RDL pattern; and

providing a stud bump [20] on the portion of the RDL pattern not covered by the insulating layer without using an under bump metal.

Higgins discloses the claimed invention except for the inclusion of a UBM pad. It would have been obvious to one of ordinary skill in the art at the time of the invention to omit the UBM pad since it has been held that the omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art (*In re* Karlson, 136 USPQ 1284).

The invention of Higgins would still operate without the UBM pad. Its exclusion from Higgins, along with the function of the UBM layer, would not make the invention inoperable and would have been well-known and readily obvious to one of ordinary skill in the art.

Higgins fails to teach the method further comprising providing a solder ball on the stud bump.

Chakravorty (figure 8d) teaches the use of a solder ball (313) on a solder stud (311).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ball on the stud of Chakravorty in the invention of Higgins because both methods are known equivalent techniques used to attach chips to other substrates.

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (571)-272-1937. The examiner can normally be reached on M-Th 7:30 AM-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Baumeister can be reached on (571)-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

David A. Zarneke
Primary Examiner
December 30, 2005